

1.		
(a)	Base clearly circled;	1
(b)	(The pentose in) RNA is ribose <u>and</u> in DNA is deoxyribose; the base thymine is only found in DNA <u>and</u> the base uracil is found in RNA; NOT: ref. helix/strands/uracil and thymine unqualified	2
(c)	Adenine with thymine <u>and</u> cytosine with guanine; Appropriate use of {data/ratios} for {human/sea urchin/wheat}; Need data on both A T and C G NOT 'they are the same' or reference to ratio the same in all organisms	2
<b>Question 1 total</b>		<b>[5]</b>

2.		
(a)	deoxyribose/ pentose/ 5 C sugar	1
(b) (i)	A-T-A-G-C	1
(ii)	Guanine pairs with cytosine/ G pairs with C = 60%/ G+ C = 60%; A+T= 40% A= 20%  (any two) Correct answer = 2 marks	2

**(Total 4 marks)**

- 3.
- (a) (i) Nucleotide; 1
- (ii) Phosphate / phosphoric acid /  $\text{PO}_4$  /  $\text{PO}_3^-$ ; 1  
NOT phosphorus / P
- (iii) Deoxyribose in DNA **and** ribose in RNA (both); 1
- (iv) Adenine, Thymine, Cytosine, Guanine (1 if 1 error). 2
- (b) **Any 4** 4
- Pairing described A-T and C-G (both needed);
- Backbone / Chains / polynucleotide formed by alternating sugar phosphate groups;
- two chains connected / joined by base pairs;
- hydrogen bonding;
- two chains (twisted) to form a helix / double helix;
- NOT alpha helix.
- Accept labelled diagram.
- (c) {forming template / code / instructions} for {protein synthesis / mRNA 1  
/ amino acid sequence / primary structure of protein / transcription}  
(accept Replication in dividing cells) /  
NOT genetic material alone.

**Question total 10**

4.

(a)

	DNA	m-RNA
Name of sugar	deoxyribose	ribose;
Number of carbon atoms in sugar	five	five;
Number of polynucleotide chains in molecule	two	one;
Location in cell	nucleus	nucleus + cytoplasm; (allow: RER/ ribosomes)

[4]

(b)

- (i) base pairing;  
Complementary/ adenine with thymine;  
not identical because of experimental error;

[3]

- (ii) passed on from parents/during fertilization/inherited/zygote formation;  
from same cell/mitosis;  
DNA replication;  
genetically identical / same base sequence/ all body cells have same DNA

[3]

- (iii) half as much; DNA (not: ref chromosomes)  
variation/ genetically different  
produced by meiosis;

[3]

**(Total 13 Marks)**

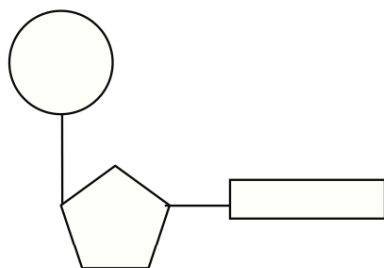
5.

	DNA	RNA
Contains a pentose sugar	✓	✓
Found in the nucleus	✓	✓
Thymine is never present	×	✓
Consists of a double helix	✓	×
Molecules short lived	×	✓
Associated with ribosomes	×	✓

**[Total 6 marks]**

6.

(a) (i)



Pentose shown as pentagon and labelled, sugar/ribose/deoxyribose [1]  
 Phosphate on C5 and labelled, phosphate/phosphoric acid [1]  
 Base on C1 and labelled, (nitrogenous) base/named base [1]

(ii) The pentose is ribose in RNA deoxyribose in DNA; [1]  
 (allow: clear description of extra oxygen e.g. sugar in DNA contains one less oxygen atom than sugar in RNA)  
 the base thymine is only found in DNA / uracil in RNA. [1]  
 (not: ref. helix/strands/uracil and thymine) Comparison needed

(b) (i) (Alternating) sugar / pentose or deoxyribose and phosphate. [1]

(ii) Adenine with thymine. [1]  
 Cytosine with guanine. [2]  
 (not: abbreviations) Correct spelling thymine/cytosine.  
 (iii) Hydrogen. (not: H) [1]

[Total 9 marks]

7.

(a) DNA contains deoxyribose (sugar); RNA contains ribose. (1)

DNA contains thymine base: RNA contains uracil (1)

DNA is a double helix / stranded; RNA is single stranded.

(correct spelling thymine; not : CTAG, ref to size / length / different forms of RNA)

8.

- (a) (i) Transfer/t RNA;  
Ribosomal/r RNA; [2]

- (ii) Comparative statements required.  
Similarity, double stranded [1]  
(allow: ref. to both are polynucleotides; not: nucleotide constituents)

Differences;  
Ribose;  
Uracil not thymine;  
Smaller.  
Found in cytoplasm  
Not a double helix [max 3]

- (b) (i) 50% [1]

- (ii) 1 mark for each base + correct %

Nucleotide	%
<i>Adenine</i>	<i>10</i>
<b>Thymine</b>	<b>10</b>
<b>Cytosine</b>	<b>40</b>
<b>Guanine</b>	<b>40</b>

Full names and correct spelling required.

9.

DNA Q mark scheme

- |     |       |  |   |
|-----|-------|--|---|
| (a) | (i)   | A DNA<br>B RNA   | 1 |
|     | (ii)  | Ribose (not: pentose)  | 1 |
|     | (iii) | Nucleus/nucleolus/mitochondria/chloroplasts  | 1 |
|     | (iv)  | Hydrogen   | 1 |
|     | (v)   | RNA/B is a short molecule, DNA/A is a long molecule;<br>Pentose in DNA contains one less oxygen.<br><br>RNA/B is much shorter than DNA/A;<br>A is helix, B is straight molecule/not helix.<br><br>Uracil replaces thymine in RNA/B.<br>(not: DNA has deoxyribose and RNA has ribose) | 1 |
| (b) | (i)   | A bond/base pairs with T and C with G.   | 1 |
|     | (ii)  | Any suitable figure from table indicating<br>A approx = T/C approx = G<br>(data and species)   | 1 |
|     | (iii) | Purines.   | 1 |

**Total 8 marks**

10.

- |     |  |   |   |
|-----|--|---|---|
| (a) | Thymine  | 1   |   |
|     | Cytosine   | 1   |   |
|     | Adenine  | 1   |   |
|     | Guanine  | 1   |   |
| (b) | (i)  | X = Nucleotide  | 1 |
|     | (ii)   | phosphoric acid/phosphate   | 1 |
|     |  | organic base/nitrogenous base/cytosine                                      | 1 |
|     |  | pentose (sugar)/Deoxyribose/5C sugar<br>(not: Pi/base/purine or pyrimidine) | 1 |
| (c) | Z = Hydrogen bond  | 1   |   |
| (d) | deoxyribose and phosphate/deoxyribose and (nitrogenous) base<br>or named/pair of entities e.g. amino acids/sugars<br>(Any 1) | 1   |   |

- (e) uracil/ribose/single strand/shorter/lower molecular weight/transcription occurring  
(Any 2) 2  
[12]

11.

- (a) **A** Pentose sugar / deoxyribose (allow: 5 carbon sugar) (1)  
**B** Phosphate (1)  
 (b) Hydrogen (Bonding) (not: H) (1)  
 (c) (i) Purine (1)  
 (ii) **C** Adenine (1)  
**D** Thymine [allow a consequential error here] (1)

Reject abbreviations A/T / consequential error if C is uracil.

- (d) Ring should cover any 1 base with 1 sugar and 1 phosphate (through dotted lines i.e. bond). (1)  
 (e) If 28% G then C must be 28% (1)  
 $(28+28 = 56) / 100 \Rightarrow 56 = 44 / (A+T = 44)$  (1)  
 $T = 22(\%)$  (1)

1 mark for each correct line.

**Total 10 marks**

12.

<b>a</b>	X	phosphate;	
	Y	deoxyribose/pentose (sugar);	2
<b>b</b>	21	29;	
	17	17	2
	Cattle	A=T/C=G;	
	Octopus	G+C=100-(A+T)	2
<b>c</b>	<u>DNA</u>	<u>RNA</u>	
	long molecule/ larger	short molecule/ smaller	
	two strands/ H bonds	one strand/ no H bonds	
	deoxyribose sugar	ribose sugar;	
	has thymine	has uracil	
			MAX 2

## Essays

1.	
(b)	<p>A. Ref to DNA <b>and</b> RNA;</p> <p>B. Diagram/description of a nucleotide with correct labels/terms (phosphate &amp; pentose sugar &amp; nitrogenous/eq base);</p> <p>C. DNA named sugar Deoxyribose; must link to DNA</p> <p>D. Ref to purines and pyrimidines;</p> <p>E. Correct identification of purines and pyrimidines (Full names only);</p> <p>F. Ref to Uracil replacing thymine in RNA;</p> <p>G. Correct base pairing A-T, C-G (<i>Allow letters;allow from diagram</i>)</p> <p>H. Description/labelled diagram of <u>double</u> helix in DNA;</p> <p>I. Held together by H – bonding;</p> <p>J. Functions of DNA (i) replication in dividing cells;</p> <p>K. (ii) code/ template for protein synthesis;</p> <p>L. Description of RNA as a single chain/ strand (of nucleotides); NOT single helix</p> <p>M. Ref correct sugar Ribose in RNA; correctly linked</p> <p>N. mRNA carries genetic code from the nucleus to the ribosome;</p> <p>O. correct reference to tRNA/ribosomal RNA;</p>
	<p><b>Question 8 Total</b></p> <p><b>[10]</b></p>



2.

- (b)
- A polynucleotide/chain of nucleotides;
  - B nucleotide consists of phosphate, sugar plus base;
  - C sugar is deoxyribose;
  - D base contains nitrogen; (allow: ref. nitrogenous)
  - E four bases are adenine, guanine, cytosine and thymine; (not: letters/ref. uracil)
  - F sugar phosphate backbone;
  - G two polynucleotide chains linked;
  - H antiparallel (stated, in context);
  - I ref. polynucleotide chains/base pairs held together by hydrogen bonds;
  - J complementary base pairing;
  - K A-T, G-C;
  - L pairing of purines and pyrimidines;
  - M double helix;
  - N purines double ring and pyrimidines are single ring;
  - O ref. sequence of bases is genetic code;
- 10**

3.

- (b)
- A Both contain the elements CHON;
  - B Both can link to form larger molecules/polymers/ref. monomers;
  - C Nucleotides consist of nitrogenous base;
  - D plus pentose and phosphate; (not: 5C sugar)
  - E bases are pyrimidines and purines;
  - F Amino acids possess an amine/NH<sub>2</sub> group/carboxylic group;
  - G Variable R group;
  - H More/20 types of amino acid;
  - I Amino acids link together by peptide bond formation/sugar phosphate backbone;
  - J Five different bases in nucleotides/5 named; (not: letters only)
  - K Bases can undergo complementary base pairing;
  - L Adenine with thymine or uracil and guanine with cytosine;
  - M By hydrogen bonds;
  - N Nucleotides carry genetic information;
  - O Sulphur containing vs. phosphate containing.

**10 MARKS**

- 4.
- (a) (i)
- |   |  |     |
|---|--|-----|
| A | DNA is a polymer of many nucleotides / nucleotide chains / polynucleotide;                           | [1] |
| B | The nucleotide contain the (5-carbon sugar / pentose sugar) deoxyribose;                             | [1] |
| C | Attached to which is a base, either thymine, cytosine, adenine or guanine;                           | [1] |
| D | The base is either a purine or a pyrimidine;   | [1] |
| E | T and C are pyrimidines, A and G are purines;  | [1] |
| F | The nucleotides are linked in a chain by alternate phosphate / sugar links/sugar phosphate backbone; | [1] |
| G | One nucleotide can join to another by a condensation reaction;                                       | [1] |
| H | DNA consists of two of these chains twisted helically / double helix                                 | [1] |
| I | (Diagram showing) strands linked through correct A-T, G-C base pairings;                             | [1] |
| J | Complimentary bases linked by hydrogen bonds.  | [1] |
- (Any 7 from A-J)
- (ii)
- |   |  |     |
|---|--|-----|
| K | DNA contains deoxyribose sugar and RNA contains ribose;    | [1] |
| L | DNA contains thymine (base) and RNA contains uracil;       | [1] |
| M | DNA the bases are paired, in RNA they are unpaired;        | [1] |
| N | DNA is a double helix/stranded and RNA is single stranded; | [1] |
| O | DNA is longer than RNA;                                    | [1] |

(Any 3 comparative points from K-O)

**[Total 10 marks]**